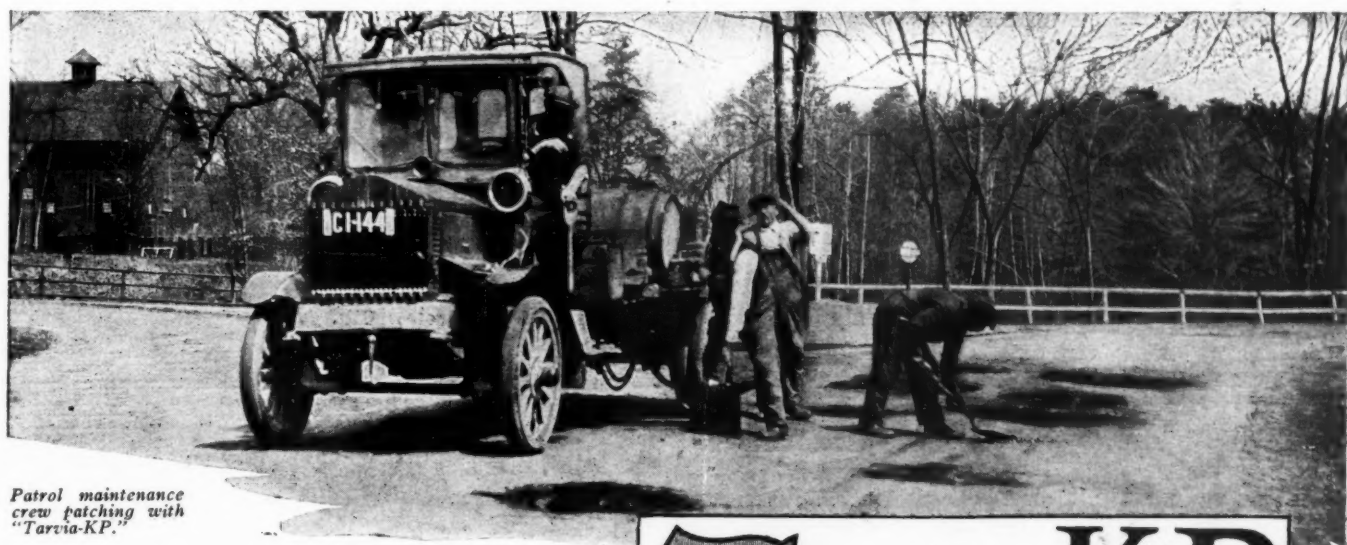


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CITY

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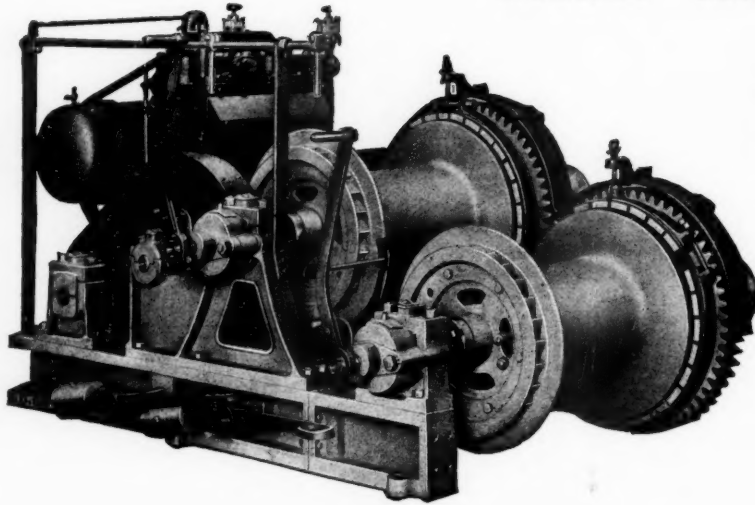
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MARCH 12, 1921

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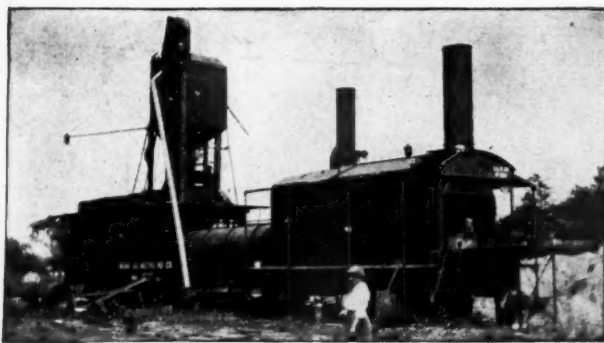
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Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879.

Vol. 50

FLORAL PARK, MARCH 12, 1921

No. 11

Linden Street Sewer Tunnel

Method of shield excavation and driving, alignment and adjustment. Erection of concrete lining blocks. Adjustable supporting traveler. Backfilling behind shield tail. Grouting joints and backfill. Rapid progress and accuracy.

The Linden Street sewer, Flushing, L. I., has a circular cross-section 87 inches in interior diameter and is 1,022 feet long with a fall of 0.21 foot in 805 feet. The invert is a little below ground-water level in sharp, good building sand and 30 to 60 feet below the surface of the ground.

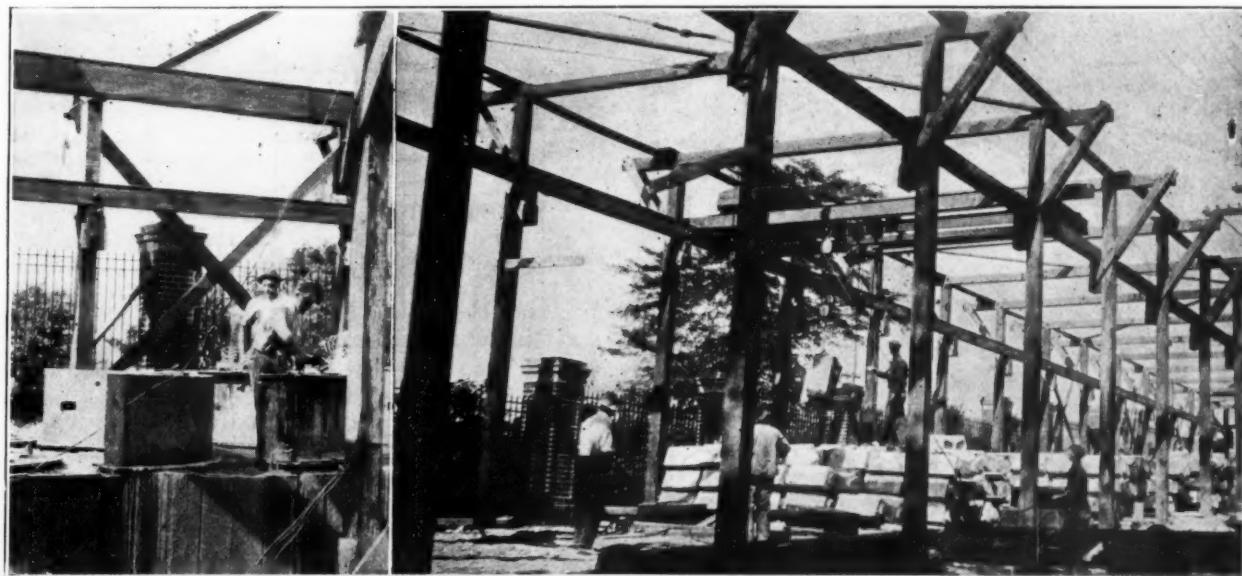
Competitive bids were received on alternative designs for pre-cast concrete lining, and for cast-iron segments lined with concrete. The bids for the latter exceeded those for the former by \$30 a foot. The contract was awarded to the O'Rourke Engineering Construction Co. in March, 1920, the work to be completed in 350 working days, at a price of \$155 per linear foot of tunnel and \$74,000 for the four shafts, making a total of \$371,910. On March 1, 804 linear feet of tunnel had been driven and the work was in advance of the schedule requirements.

The shield method is being used, operating with

a single heading driven from a shaft at one end, through two intermediate shafts at each of which the alignment makes a horizontal angle of about 90 degrees.

The tunnel is being constructed under the direction of the Bureau of Sewers, Borough of Queens, New York City. Before the contract was awarded, designing engineer Frederick Seeley visited the Ford tunnel at River Rouge, Detroit, which is 12 feet 8 inches in diameter and 5,500 feet long, for the purpose of studying its design and construction. The Ford tunnel was driven by the shield method and was lined with segmental concrete blocks 18 inches thick, employing novel methods and new appliances corresponding closely to those since adopted for the Linden Street sewer.

The lining consists of hollow cylindrical rings 7 feet 3 inches in diameter inside and 9 feet 3



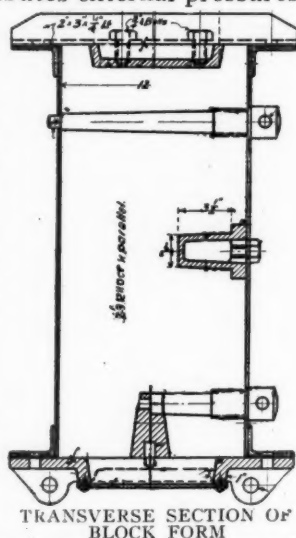
BLOCK FORM AND BLOCK STRIPPED AND RESTING ON BASE PLATE

SEGMENTAL CONCRETE LINING BLOCKS, SPACING IN STORAGE YARD COMMANDED BY TRAVELING CRANE

inches in exterior diameter. They are 27 inches long parallel with the axis of the tunnel and are completely enclosed by an envelope $3\frac{1}{2}$ inches thick composed of small gravel that fills the cavity left by the withdrawal of the shield tail, prevents displacement of the ground and preserves alignment of tunnel and distributes external pressures.

Each ring is composed of six duplicate interchangeable segmental blocks with radial joints and a key segment, weighing about 1,500 pounds. The radial joints are staggered one half the length of the segments in adjacent rings, an arrangement secured by shifting the key segments one half block right or left. Each segment block is provided on one vertical face with two $2\frac{1}{4}$ -inch projections $17\frac{3}{4}$ inches long and $8\frac{7}{8}$ inches wide, with tapered sides and rounded ends which engage corresponding recesses in the opposite faces of the segment in the adjacent range, the recesses being a quarter of an inch larger and with slightly greater taper to provide an opening to hold grout between the projection and sides of the recesses. It also provides an easy engagement and accurate adjustment and maintains the alignment.

One-third of the blocks are provided on the intradosal surface with grout holes leading to the middle of the transverse joints and with two 2×5 -inch curved inclined grip holes $4\frac{1}{4}$ inches deep, to receive the jaws of the erecting device. There are also, near the rear vertical face of each block,

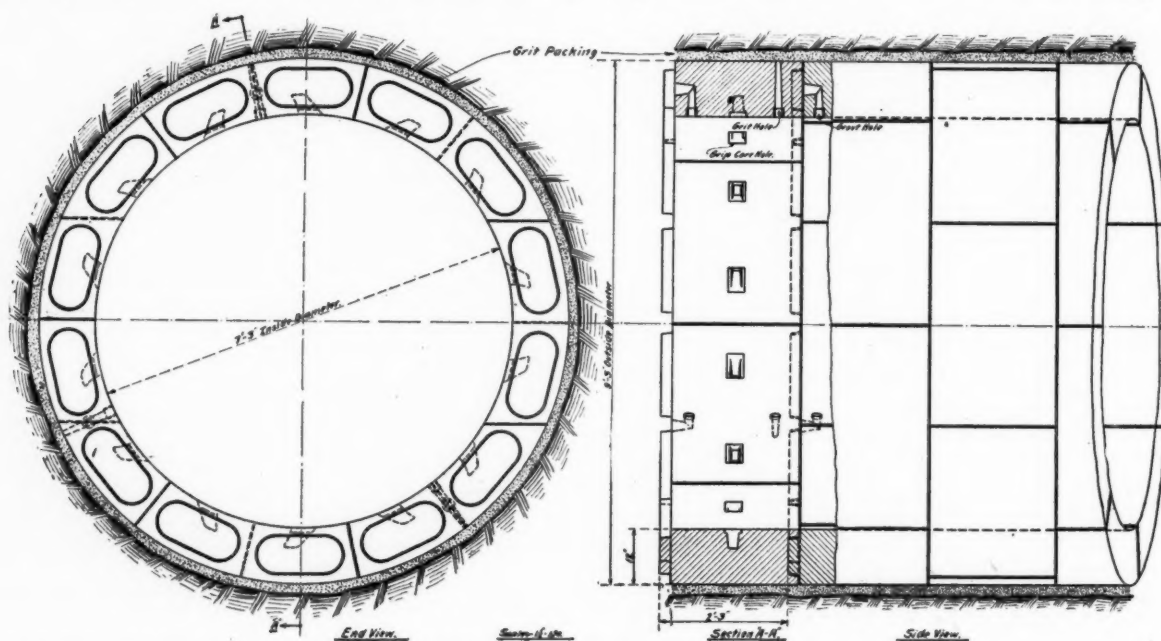


two grout holes passing entirely through the block to deliver grout to the exterior of the tunnel ring. All of the grout holes are slightly tapered to a minimum diameter of $1\frac{7}{16}$ inches, and at the inner ends are provided with a special screw thread, cast in the concrete, to receive temporary nipples screwed in for the grouting connection.

The tunnel lining requires over 6,000 segmental blocks, all of which are cast on the surface of the ground at the top of the shaft at one end of the tunnel. Casting was commenced in the early part of August, 1920, and as the blocks are made at the rate of 36 daily, a considerable number were ready in advance of the commencement of the erection in December, and sufficient provision was made for their seasoning at least one month before their use, although it is considered that they could be safely assembled when two weeks old. On February 6, when the note for this description was made, more than 3,000 blocks had been cast and about 1,500 finished blocks were in the storage yard waiting to be used. The blocks are made with 1:2:4 concrete using $\frac{3}{4}$ -inch broken stone, and are so carefully made that notwithstanding the rigid inspection none of them have been rejected.

The segmental blocks are cast with the curved side vertical, in steel forms with bent side plate $\frac{3}{16}$ -inch thick, countersunk, riveted to top and bottom exterior flange angles. The bottom flange angles are detachably clamped to cast iron base plates recessed for the interlocking projections in the transverse joints of the segments. The tops of the forms are open and receive cast iron core prints bolted to cross pieces that are accurately located on and attached to the upper flange angles to provide for the recesses in the faces of the blocks. Tapered steel and iron cores are attached to the forms to provide holes for the grit, grout and the erector grips.

Each form is nearly semi-circular in plan and is provided with two vertical radial dividing plates



CONCRETE BLOCK TUNNELS, SHOWING JOINTS IN LINING AND HOLES FOR GROUTING AND EXTERIOR PACKING

that separate it into compartments for three segment blocks having an angular length of 51 degrees, 25 minutes and 43 seconds, equal to a little more than 3 feet 2 inches on the intrados.

The forms, which were built by the Davis &



TRAVELING CRANE IN BLOCK YARD

Thomas Company, are about $12\frac{1}{2}$ feet long measured on the extrados, 2 feet $3\frac{3}{4}$ inches high and 18 inches wide overall. Including the base plate they weigh about 3,000 pounds each. They are finished to an accuracy of $1/50$ inch, so that the projections of the blocks are in perfect contact throughout the entire ring with the bottoms of the recesses in the adjacent ring, giving an even distribution of stress and avoiding the cracking or spalling of blocks when they receive the stresses due to shoving the shield.

Concrete is mixed in a $\frac{1}{2}$ -yard Ransome machine delivering to a pair of buckets suspended from an electric overhead traveling crane that commands the casting yard, which is about 24 feet wide and 100 feet long. The concrete, mixed moderately dry, forms a quaking mass that is thoroughly spaded in the forms until the small amount of water flushes to the top and overflows, after which the core prints for the recesses are forced into the upper surface of the concrete, displacing the excess material and leaving a stiff concrete which is accurately smoothed off to the plane of the finished upper edges of the form.

After the concrete has set five hours or more, according to weather and convenience, the forms are stripped, leaving the segment blocks on the cast iron bases until after the concrete is 18 hours old, when the blocks are removed and piled up in storage alongside the casting yard, thus releasing the bases for another set of blocks, and so on. About 11 yards of concrete are required for 36 blocks which are cast in $1\frac{1}{4}$ hours by a force of nine men.

(To be continued)

Good Concreting Records

The outlet work for the Taylorsville dam in the Miami Conservancy District is a massive concrete structure 241 feet wide, 628 feet long and 111 feet high, containing 45,000 yards of concrete, some of it placed in walls up to 50 feet thick. The concreting was done in about one year, during which the schedule proposed called for an average amount of 100 yards per 10-hour working day for about five months and 200 yards per day for the remaining time, an amount which was not quite reached until near the end of the job, when it was exceeded. The records were 568 yards in one day, July 29, and 2,408 yards in one week and 9,280 in 27 consecutive working days.

The original estimate of cost was \$9.47 per yard and the actual cost was exactly \$10 per yard, composed of \$3.51 labor; \$3.02 supplies, including cement and repair parts, sand and gravel being excavated by conservancy forces; power \$.37; plant, erection, depreciation and camps, \$2.43; industrial insurance and overhead, \$.67. The labor cost of \$3.51 was divided into thirteen items, of which the principal ones were \$.528 for excavating and washing gravel; \$.540 for mixing and placing concrete; \$.944 for building forms; and \$.500 for dismantling and general cleaning up. The work was executed with a force of 95 men, which apparently does not include those employed in excavating and washing the gravel.

Wasteful Refuse Collection

In some notes on refuse collection and disposal by a superintendent in charge of such matters in an English city and published in "Municipal Engineering and Sanitary Record," a peculiarly wasteful practice was narrated as having been observed by him in one of the suburbs of London. He wrote: "To my surprise I found when the day for emptying the dust bin arrived, not one but two horses and carts came to pick up the refuse. While one cart was loaded the second horse and cart trailed along empty behind and was not loaded until the first cart was filled. I expressed my surprise but was told that it was the usual practice, and on occasion three horses and carts were similarly used." He states that he could learn no reason for this and is at a loss to "imagine any possible advantage either in cost or convenience that could be served by such an unusual arrangement."

Skagit River Electric Plant

Seattle interests are taking steps for the development of an enormous hydro-electric plant on the Skagit river, Wash., which drains 3,000 square miles. According to C. S. Uhden, engineer in charge of the work, the city has commenced construction of the first 75,000 h. p. unit of the power that it is estimated will cost about \$10,000,000; 48,000 h. p. will be first secured by a temporary crib dam pending the construction of a concrete dam 240 feet high that has involved the building of 26 miles of construction railway at a cost of \$1,215,000.

The St. Louis Transit System

Synopsis of a report made by the City Plan Commission, which deals chiefly with re-routing street cars.

The City Plan Commission of St. Louis, after two and a half years of careful study, has submitted to the Board of Public Service a report presenting proposals for the development of the transit lines of the city. This report contains 36 pages and several maps, tables, and diagrams which aid greatly in setting forth the various features of the problem. Two of the diagrams published herewith give an idea of the thought and ingenuity exercised by the commission and its engineer, Harland Bartholemew, in presenting the results of their study of the problem.

All of the city railway lines in St. Louis are operated by a single company, but there are a number of franchises which require the continuation of operation over certain routes, some of which made efficient and economical operation impracticable. Partly because of this, partly because of over-financing and over-estimate of the growth of the traffic, the operating company went into the hands of a receiver in 1919. The plan submitted looks to the re-routing and re-connecting of the tracks of the various original companies and provision for traffic for the next 10 to 25 years. Included in the plans is the opening, widening and extension of numerous streets which will facilitate more direct routing in some cases.

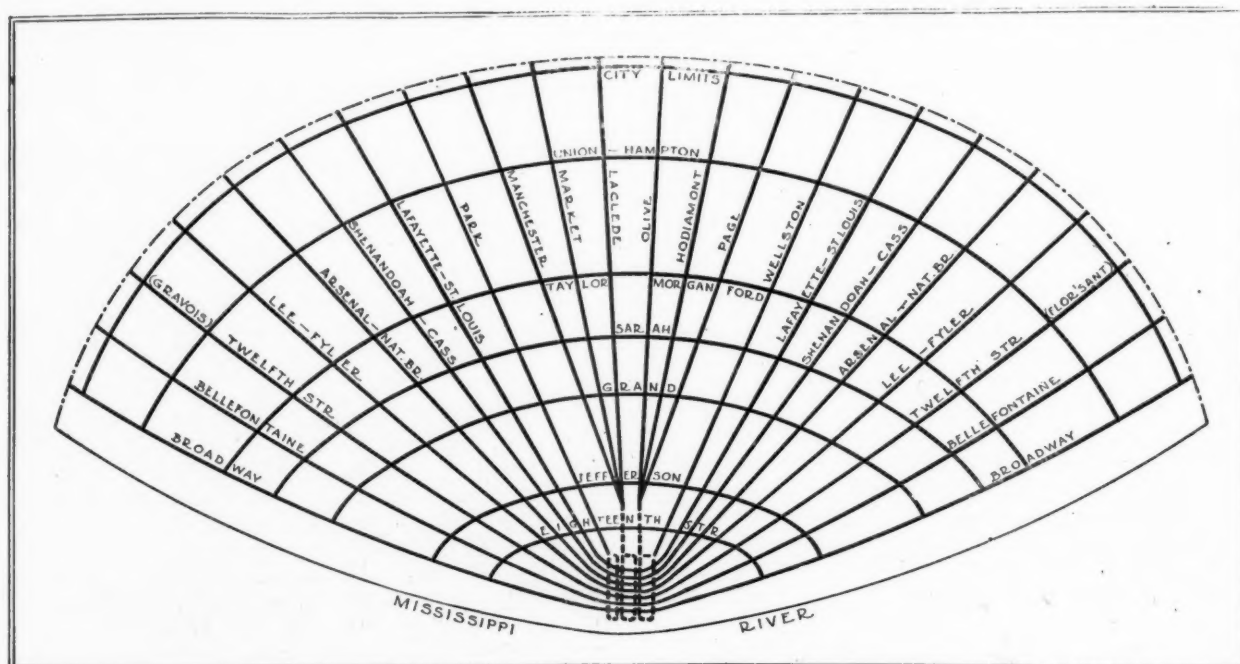
In studying the present situation the commission compiled statistics of traffic from 1900 to date

which show that the total number of passengers was nearly three times as great in 1919 as in 1900. The time required to reach the center of the city over the routes available from the various sections of the city were learned and plotted on a diagram, areas within 10 minutes, 20 minutes, 30 minutes, etc., of the center being indicated by different colors. One small area was found to be 90 minutes from the business center while very considerable areas were 50 and 60 minutes beyond. A companion diagram showing the isochronal zones for the routing proposed by the commission shows very little of the city lying beyond the 40-minute zone and none beyond 60 minutes.

The problems of the immediate future are stated to be relief of the congestion in the business district and more direct routings to all parts of the city. It is believed that by re-routing, the necessities of the city can be met and that rapid transit will not be necessary for the present.

In laying out a plan for re-routing the traffic, it was considered desirable to approximate all routes to a theoretical fan-shaped system, as is shown on the diagram presented herewith. "A feature of the theoretical solution of the transit plan is to gather a majority of the east and west lines into a subway in the business district and so routing north and south lines through the business district as practically to avoid any intersection of lines, which is one of the present pregnant causes of delay and congestion in the business district." The plan would call for the abandonment of about 8 miles of single track and $7\frac{3}{4}$ miles of double track, and the construction of $4\frac{1}{4}$ miles of new single track and $2\frac{1}{4}$ miles of new double track. Certain extensions of existing lines totaling about 10 miles of new double track lines are proposed also.

The plan provides for two distinct loops, either



THEORETICAL DIAGRAM OF PROPOSED TRANSIT SYSTEM FOR ST. LOUIS.
For the other diagram referred to, see cover of last week's issue.

of which may be used for surface car operation or for rapid transit lines. It is estimated that an initial short loop subway for surface car operation would cost \$7,000,000; that another loop for rapid transit would cost about \$17,000,000, and that a complete rapid transit scheme including the loop and routes to the western, northwestern and southwestern parts of the city, would cost \$80,000,000. The rapid transit system designed consists of two distinct parts, one for surface cars in the downtown district and the other for a complete rapid transit system operating entirely by subway or elevated tracks. There would be no contact of the two systems except at stations used in common by the two. It is estimated that the cost of subway construction would be from $5\frac{1}{2}$ to 7 times as great as that of an elevated structure.

The report gives in detail the routes to be followed by each of 19 surface lines as the first step, to be followed with a combination of certain lines and shortening of several of the routes. The commission consists of the presidents of the board of aldermen and board of public service, directors of streets and sewers and of public safety, and the commissioner of parks and recreation, as members ex-officio, together with eight citizens with E. J. Russell as chairman. Frank E. Lawrence, Jr., is secretary. Harland Bartholemew is engineer.

The Georgetown Bridge*

Construction of seven reinforced concrete arches of 85 to 208 feet spans, each with two segmental ribs cast in sections on steel truss centers floated from span to span.

During concreting, the very heavy spans were supported on sets of four massive steel arch trusses, two simultaneously under the center arch rib and later used one under each of the side ribs, so that a total of eight arch trusses sufficed for the simultaneous construction of two spans.

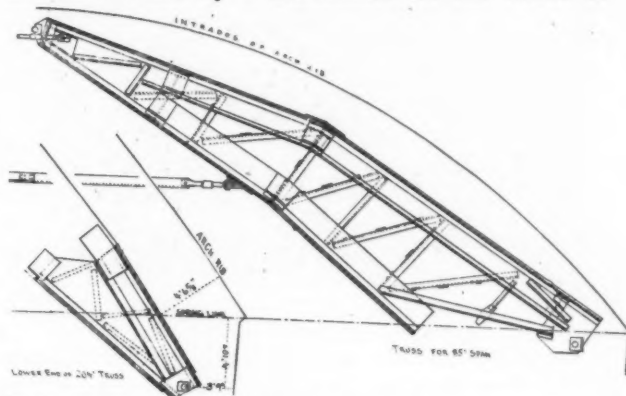
The three-hinge arch trusses, designed and fabricated by the Blaw-Knox Company, were of special construction adapted to serve the different lengths of span by modifications of the end panels, trusses intended for the center or maximum span of 208 feet being reduced to fit the other spans successively by removing members in their end panels.

ARCH-CENTER TRUSSES

Each steel arch-center truss was composed of two semi-trusses pin-connected at the crown and to the skewback pedestals. For the center span the distance from center to center of skewbacks was 196 feet 6 inches, and the rise between centers of skewback and crown hinge pins was 56 feet $2\frac{1}{8}$ inches.

The complete semi-trusses are each approximately lune-shaped, made in six panels with in-

clined top and bottom chords, the inclination of the top chord being changed at every panel point while that of the bottom chord is changed at only one point. The two semi-trusses are connected at the crown and by a horizontal tie bar made of



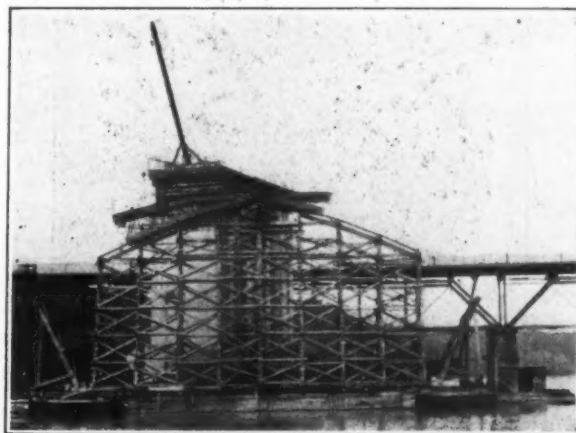
DETAILS OF ARCH RIB TRUSS CENTERS

two angles back to back at an elevation a little below the middle of the lower chord.

The lines connecting the skewback and the crown hinge pin are inclined about 30 degrees to the horizontal. The top chords are slightly divergent from the chords of the intrados of the concrete arch and are distant from them from 1 foot $9\frac{1}{2}$ inches at the haunches to 4 feet $6\frac{5}{8}$ inches normally at the skewbacks.

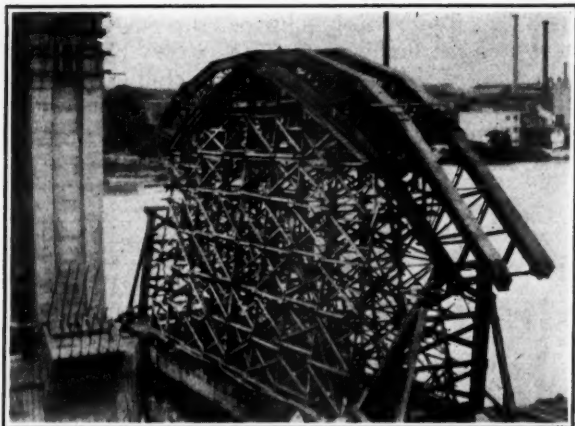
SUCCESSIVE MODIFICATIONS OF TRUSSES

Both the 204-foot and the 208-foot spans are erected with the complete arch trusses. For the erection of the 187-foot spans the short lower end sections of the semi-arch trusses are removed and the pins in the skewback pedestals engage holes in the lower ends of the upper chords of the bottom panels of the trusses. For the 152-foot span the second section is removed from the lower ends of the trusses and for the 85-foot span a third section is removed; the skewback connections in both cases being similarly made through the top chord at the point of its intersection with the lowest remaining web member. These changes, of course, made the semi-trusses still more unsymmetrical but obviated the necessity for any changes in the construction between the skewback and the crown.



ASSEMBLING CROWN SECTIONS OF ARCH TRUSS CENTERS ON FLOATING FALSEWORK WITH PIER DERRICK

*Continued from page 205.



PAIR OF ARCH CENTER TRUSSES NEARLY COMPLETED ON FLOATING FALSEWORK

Both top and bottom chords are compression members with plate and angle trough-shape cross-sections, and the web members are made with pairs of angles connected by tie plates and riveted to the web plates of the chords. The horizontal tension member, 24 feet above the skewback pins in the longest spans, is made of a pair of angles pin-connected at each end to a sleeve-nut rod with a clevis engaging a bent connection plate riveted to the lower chord of the truss. The horizontal member is intermediately supported against sagging by six $\frac{3}{4}$ -inch vertical rods connected to the lower chords of the trusses.

The upper ends of the semi-trusses have steel castings with concave bearings of about 100 degrees for 6-inch crown hinge pins. They are also tied together by horizontal sleeve-nut rods pin-connected to lugs riveted to the trusses. During erection the rods were supplemented by eight $\frac{7}{8}$ -inch bolts through the hinge castings.

The lower ends of the trusses are secured to the pier by horizontal anchor bolts projecting from the face of the pier, and engaging lugs riveted to the ends of the trusses. This provision enables the trusses to be slightly raised or lowered or moved in either direction longitudinally, to give them close adjustment with the exact position of the arch rib.



ARCH RIB TRUSS CENTERS SUPPORTED ON I-BEAM GRILLAGE AND ADJUSTMENT WEDGES AT PIER

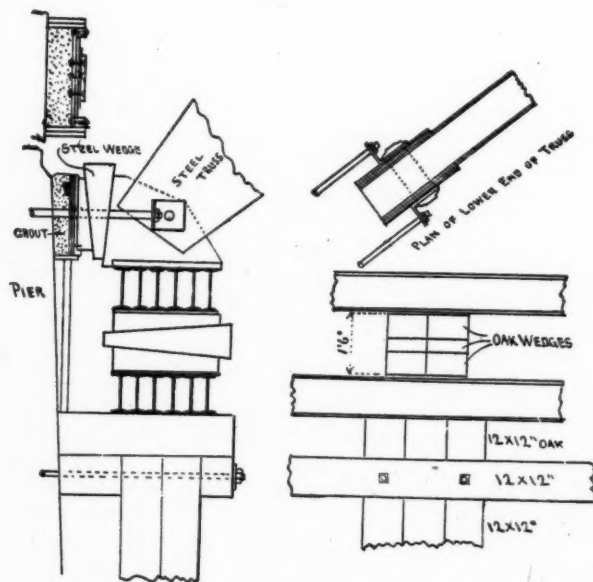
TRUSS SUPPORTS

The ribs are supported by six 12x12-inch oak posts at each end of each rib, seated under water on a concrete ledge of the piers, and on top of these are 12x12-inch oak caps. There are eight sets of these bolted to each side of the pier, with a steel I-beam grillage on top running full length of the pier.

On the grillage beams and on the center line of the rib there are three oak wedges 2 feet wide and 18 inches high. On the wedges and directly under the shoes are sets of grillage beams long enough to take the two shoes of a pair of ribs. The horizontal thrust is taken by a beveled cast steel wall plate mounted in place against the face of the pier and the adjustment between this and the shoe, by a cast steel wedge. The cast steel wedges were suspended just above the wall plates ready to be dropped in place when wanted.

Garbage Disposal Plant at Middletown

Middletown, Ohio, is about ready to put into service a garbage incinerator which was completed the latter part of February. Meantime the city is considering the matter of collection of garbage and other refuse. Dr. G. D. Lummis, of the Board of Health, has taken an active interest in the matter and recommends that the city itself collect all refuse, claiming that this can be done for 8 cents a year for each property where now the cost is \$5.20 per year paid to private parties for removing the refuse. The city commission has decided to turn over the operation of the incinerator to the Board of Health and probably will also adopt the recommendation for municipal collection. It was suggested that the chassis of three or four discarded jitneys be obtained and bodies for refuse collection be purchased from a Cincinnati firm which manufactures them for this purpose, the bodies costing about \$900 each.



SUPPORT AND ADJUSTMENTS OF ARCH RIB TRUSS CENTER

PUBLIC WORKS

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Indefinite Plans and Specifications

The purpose of plans and specifications is to show amount, character and quality of work, how it should be done and, together with the contract, the price that is to be paid for it. Characteristic differences of method, quality or price should be unmistakably defined. There should be no contradictions in the specifications, plans or contract, or between any two of them, and all essential requirements and prices should be perfectly clear.

Where the work is done on a unit price basis, classifications should be very definite and unmistakable. Nothing in any part of the work should be left vague or indeterminate that can be defined. If it is impossible to determine accurately in advance the governing principles should be stated, and attention called to the manner in which final decisions will be made.

A frequent and inexcusable source of contention is incomplete, careless or unfair classification of work, material and prices. These should be definitely shown in the specifications and provision should be made there for modifying or en-

larging the classifications if circumstances or alterations make it necessary.

Two of the most fruitful sources of dispute are classifications and changes in excavation and in concrete work. Especial care should be taken to describe, limit and define these and it is much better to provide too many than too few classifications, especially where the work is at first uncertain or liable to change or development during construction. For the materials in the finished structure there is no excuse for ambiguity in classification. The quantities of each class should be distinctly defined, the class of every member or portion of the work should be stated, the estimated amounts should be given and the classifications should be noted and their divisions marked on the drawings. If this had been done as it should and easily could have been in the work described on page 227 of this issue no controversy would have arisen.

Flexibility of Construction Methods and Equipment

The most efficient and economical results in construction work are generally obtained by the most judicious use of standard methods and equipment supplemented in an emergency or unusual conditions by new devices or by ingenuities developing special resources or avoiding special dangers. The engineer and contractor who is most familiar with standard practice and has the ability to modify it to the best advantage is likely to secure much the best results.

An excellent illustration of this is found in the Georgetown bridge, described in this issue, where long concrete arch spans have been built safely over a somewhat dangerous channel on steel false work trusses simply adjusted to different lengths and handled on movable false work. They were assembled on floating false work, itself of a special character designed to distribute the load on a plurality of barges forming an easily movable and somewhat flexible support. They were transferred from span to span supported on the same false work.

Special provision was made for the rapid and accurate adjustment of the centers by means of pairs of wedges in vertical and horizontal planes, which also insured the expeditious striking of centers after the arch concrete was set.

In order to mix and distribute a large quantity of concrete at a considerable range of elevations in a long line, three separate plants were provided commanding the entire work and securing special concentration at required points.

The foundations for the river piers were built in the dry, in cofferdams of special design and efficient construction which were so arranged that the framework and bracing were advantageously completed on shore, sunk to position and then enclosed by unusually strong and efficient sheet piles of a special type designed to utilize for preliminary service the structural steel afterwards forming part of the permanent floor system and thus avoiding a considerable expense for steel sheet piles that would otherwise have been used for the work.

New England Road Builders Ask Relief

The Executive Board of the New England Road Builders' Association has recently prepared a number of important requests and recommendations concerning highway construction in Massachusetts which have been submitted to and discussed with the commissioners of the Highway Division of Massachusetts. They are intended to afford immediate relief to contractors on state work from burdens arising from the unnecessary retention of money by the state and from increased costs that could not be foreseen, and to secure some improvements in the character and details of specifications for highway work.

The principal requests are for:

1. The immediate payment of money unnecessarily retained by the state.
2. Reimbursement of increased cost occasioned by advance of freight rates unforeseen at the time contracts were awarded.
3. Extra allowance on account of increased labor costs that could not be foreseen.
4. Reduction of reserved percentage.
5. Acceptance of the work in sections.
6. Payments on materials delivered or stored for the work.
7. Investigation and approval of materials previous to advertising for bids.
8. Changes in specifications including increased allowance for overhaul; classification of excavation into five classes; uniform method of placing stone fill; payment for removal of trees; payment for extra work.
9. Bi-monthly estimates.
10. Measurements of roadway excavation.
11. Filing plans and other information at District Engineer's office.
12. Provision in advance of methods of providing for travel and detours previous to invitations for bids.
13. Modification of unit prices to correspond with changes of quality or quantity.
14. Authorization of engineers to adjust claims for delays and reimbursements.
15. Classification of unit price work and provision to contractors of information concerning the work when bids are invited.

Replying to the above petition the Massachusetts Department of Public Works has replied to the New England Road Builders' Association, in part:

No change will be made in the present contract requiring a 15 per cent retained percentage. Agreement will, however be made to provide for reducing the percentage of retained percentage on such portion of a contract as may be completed so as to allow use of the same by the public, to 5 per cent of the estimated value of that particular portion of the work. A retained percentage of 15 per cent will apply to other work on the uncompleted portion of contract that may go over the winter season.

Payments on materials delivered or stored for the work.

The Commissioners will consider requests under this section, each case on its own merits, but no consideration will be given to requests for payment on perishable material.

Investigation and approval of material previous to advertising for goods.

The Commissioners will provide that all engineers and officials of the Department will furnish all possible information to aid contractors in having as full an under-

standing of conditions associated with each contract as it is possible to secure, but no guaranty as to conditions will be made by the Department or any official acting for the Department.

Recommendations for changes in the specifications for State Highway work.

a. Increased allowance for overhaul.

Specifications are now being printed with a change so that one cent will be allowed for overhaul instead of one-half cent as in the past. No change in other conditions referred to overhaul.

b. Classifications of excavation.

Specifications are now being changed so that ledge excavation will include removal of all stones in stone culverts.

c. Payment for removal of trees, etc.

There will be no change made in the specifications, but where there are a large number of trees of substantial size, a special rider will be included in specifications relative to the removal of such trees and stumps.

d. Payment on extra work.

The Commissioners will agree to provide in the specifications, in connection with payment on extra work, provision to include expense of workmen's compensation insurance, public liability insurance and the contractor's bond.

"Bi-monthly estimates."

We assume you mean semi-monthly estimates, and these will be continued during the coming year.

Plans and other information should be on file at district engineer's office.

Arrangements will be made to have accessible to contractors at the offices of different district engineers, where the work may be proposed, a complete set of plans and such information as the Department possesses relating thereto.

Decision on method of providing for travel previous to calling for bids.

The Commissioners will comply with this request wherever possible.

Requests not enumerated above were not granted.

For a Rhode Island Sewerage District

Providence, Rhode Island, is now discussing the formation of a metropolitan sewerage district embracing the cities of Providence, Pawtucket, Central Falls, Cranston and Woonsocket, and the towns of East Providence, Cumberland, Lincoln and North Providence, all of which discharge sewage into Narragansett Bay and the streams discharging into it. Some form of co-operation between these several municipalities would seem to be necessary to the success of any effective plant for purifying Providence harbor and the bay beyond. Although industrial corporations are responsible for a good deal of the oil and other filth reaching the harbor, cities and towns contribute the most dangerous, if not the most offensive portions of it. A bill has been introduced in the House for creating a sewerage district of the cities named, the commission in charge of the same to be composed of the mayors and the presidents of the cities and towns.

As we have stated a number of times, it is unfortunate that in all cases sewerage and water works problems could not be worked out on the basis of geographical and topographical boundaries, rather than wholly in accordance with political ones as is the almost universal practice. Could this plan be generally followed in the original inception of such systems rather than delayed until necessities of sanitation make co-operation necessary, much expense could be saved to all concerned in many instances.

PAVEMENT LAID DURING 1920

City and State	Sheer Asphalt	Asphalt Concrete	Tar Concrete	Warrenite- Bitulithic®	Bitoslag	Rock Asphalt	Willite	Asphalt Macadam	Tar Macadam
Alabama:									
Birmingham				6,925					
Florence				75,404					
Sheffield				40,112					
Arizona:									
Douglas		38,000						3,000	
Mesa				11,732					
Phoenix				137,106					
Prescott				17,625.8					
Tempe				28,937					
Yuma				18,268					
California:									
Chico				200,000					
Chula Vista				60,905					
Dinuba				44,437					
Dixon				68,482					
Eureka				75,363					
Fresno				192,636					
Fowler				7,426					
Gridley				65,179					
Hanford				193,161					
Holtville				58,690					
Lodi				17,651					
Los Angeles	136,055	5,510		51,721					
Martinez				80,358					
Marysville				18,254					
Modesto				88,663					
Oxnard				110,994				44,473	
Pasadena	62,000§								
Reedley				62,661					
Sacramento				26,551					
Sanger				38,281					
San Diego				79,337					
Santa Barbara				45,716					
Selma				66,234					
Stockton				15,786					
Turlock				53,206					
Ventura				34,962					
Woodland				55,989					
Yuba City				4,299					
Colorado:									
Ft. Morgan				45,335					
Connecticut:									
Bridgeport				159,205					
Shelton	700c								
Stamford									12,000
Florida:									
Daytona Beach				27,057					
Georgia:									
Augusta		4							
Idaho:									
Blackfoot				11,129					
Buhl				40,970					
Caldwell				46,340					
Coeur d'Alene				14,291					
Pocatello				91,684					
Preston				37,973					
Twin Falls				291,597					
Illinois:									
Chicago	25.80	.02						10.53	
Chicago Heights		37,000							
Moline		11,780							
Oak Park	12,740	35,653							
Indiana:									
Evansville	115,071.02								
Kokomo	37,857.5								
Wabash	28,000								
Iowa:									
Centerville				10,434					
Des Moines				17,841					
Dubuque				28,760					
Jefferson				37,198					
Newton				40,318					
Parkersburg				22,361					
Tama				20,905					
Kansas:									
Kansas City		10,700				66,000			
Louisiana:									
Alexandria				775					
New Iberia				11,984					
New Orleans				95,158					
Maine:									
Lewiston									21,000
Waterville								6,000	1,200
Maryland:									
Frederick		400						4,500	
Massachusetts:									
Cambridge				32,200					
Chelsea				9,463					
Fall River				74,110					
Framingham								425	13,300
Lawrence								60,300	
Lowell									9,895
Malden									5,000
Medford									3,757
Needham								10,000	
New Bedford				82,286				26,809	21,703
Newton									
Newtonville				462					
Scituate				512				2,200	
Webster									
Michigan:									
Battle Creek	28,215								
Saginaw	10,000								

PAVEMENTS LAID DURING 1920 Continued

City and State	Sheet Asphalt	Asphalt Concrete	Tar Concrete	Warrenite- Bitulithic*	Bitoslag	Rock Asphalt	Willite	Asphalt Macadam	Tar Macadam
Minnesota:									
Alexandria				32,848					
Biwabic				37,179					6,500
Chisholm									
Duluth				23,888					
Eveleth				20,677					
Fairmont				24,460					
Hopkins				9,915					
Litchfield				38,062					
Marshall				41,029					
Virginia				7,734					
White				12,840					
Worthington				30,796					
Mississippi:								10,000	
Corinth				12,638					
Greenwood		30,000							
Pascagoula				26,224					7,500
Missouri:								11,320	
Brookfield									
Jefferson City								1,878	
St. Louis	162,289	2,289		70,578					
Montana:									
Roundup				11,294					
Nebraska:									
Columbus				64,859					
Cozad				27,857					
Nebraska City		28,000							
Ord				31,069					
New Jersey:									
Asbury Park				5,944					
East Orange				64,169					
Harrison				6,943					
Irvington				5,590					
Kearny				11,777					
Orange	51,602	1,854		69,213	3,678	8,467		3,347	
Paterson				33,520					
Perth Amboy									
Roselle Park		119		14,000					
West New York									
New Mexico:									
Albuquerque				101,318					
Las Vegas				28,196					
East Las Vegas				23,105				1,028	
Poughkeepsie									
Raton				13,876					
New York:									
Albany	15,350	5,600							
Auburn				14,000					
Cohoes				8,021					
Gloversville				10,132					
Hempstead				4,355					
New Rochelle				18,140					
North Hempstead				5,700				34,584	
North Tonawanda				10,130					
Richmond	8,944	15,367							
Syracuse	4,38								
Tonawanda				7,366					
Troy				11,414					
Utica				17,362					
North Carolina:									
Asheville	2,781	350							
High Point				14,954					
Salisbury				55,891					
Winston-Salem				66,568					
North Dakota:									
Devils Lake				70,000					
Fargo				50,000					
Jamestown				53,167					
Wahpeton				15,175					
Ohio:									
Cleveland				48,092					
Garfield Heights				13,343					
Hillshoro				15,123					
Norwood				5,861					
Toledo	86,636	41,705							
Washington CH.	45,073								
Oklahoma:									
Miami				131,020					
Oregon:									
Athens				17,137					
The Dalles				39,448					
Enterprise				71,718					
Forest Grove				36,718					
Freewater				13,329					
Hillsboro				2,887					
Klamath Falls				25,110					
Milton				33,589					
Ontario				48,015					
Pendleton				12,076					
Portland		12.06		5,084					
St. Helens									
Pennsylvania:									
Erie	137,000								22,207
Hazleton									8.89
Philadelphia	22.89								
Pittsburgh	69,609			29,400					
Sayre									9,740
Summit Hill									
Wilkes-Barre	20,968							24,314	
Rhode Island:								87,867	
Newport									
Pawtucket									

*Most of the figures in this column were furnished by Warren Brothers Co. § Square feet. C-Dollars.

Construction Questions Answered

How Much of Bridge Superstructure is Classified as Hand Rail Concrete?

Should be clearly defined in plans and specifications. If indeterminate, may be fixed by method of construction, by function, by proportions of concrete, by cost of construction, by current practice, by precedent or by mutual agreement.

Montana, January 24, 1921.

Editor, PUBLIC WORKS.

Dear Sir:

Under "Construction Questions Answered" may I impose on your good nature for advice. I am enclosing detail of hand rail on the bridge I am now constructing. The contract price of class "A" concrete per cubic yard is a certain amount, and the concrete in the hand rail is a certain price.

What I desire is the opinion of some engineer or organization as to what is the intersection between the railing concrete and the floor slab so that I may determine the basis on which I should receive pay for the railing concrete, as it is much more expensive than the floor slabs. Would all concrete above the floor slab be considered railing concrete?

If I have not made myself plain, I should be pleased to furnish you further information.

If this information can be furnished me, I shall be glad to pay any expense that may be incurred.

Thanking you for any courtesies shown, I am,

Very truly yours,
GENERAL CONTRACTOR.

(Your inquiry is welcome, as are all concerning any phase of construction interests, whether of conditions, requirements, methods, equipment, precedent, efficiency, alternatives, difficulties or successes. If we have not the necessary information at hand it is easy to confer with friends who do have it, or to consult authorities and references that are more accessible here than in some remote places or to people unfamiliar with them. In any event, there is never any question of cost to the inquirer and we do not wish anyone to hesitate to ask any bona fide question.)

Your letter and the accompanying blueprint do not give sufficient information for a decisive determination of the amount of concrete to be included in the hand rail classification.

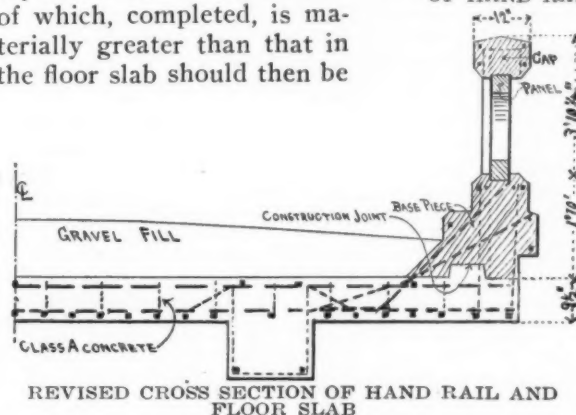
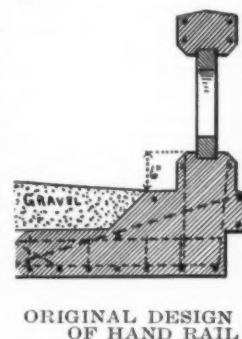
The simple contract provision that the concrete in the railing shall be paid for at a certain price per cubic yard and that class "A" concrete shall be paid for at another price, is not sufficient without definition in the specifications or additional instructions, or data on the drawings. In the absence of these, the decision is likely to be arbitrary and to be influenced very much by the fair-mindedness, or the reverse, of the engineer.

Without additional information or restrictions it is an illustration of the unfortunate class of vague, contradictory or indeterminate specifications (including plans) that are a fruitful source of dispute, litigation and general delay and loss, for which there is no excuse. Of course if both contractor and engineer are broad-gauge, fair-minded, practical men, the question can easily be decided on its merits, and the same classification and payment be secured as should be if it had been provided for in advance.

The given data are so inadequate that any decision made on them or any precedent of similar work would have little value for comparison, and the decision becomes largely a personal or local one. It should, therefore, be decided solely on its merits and the current practice, if any, of the same engineer and contractor for the same class of structures in the immediate vicinity, if any such cases exist.

The specifications should have provided that the floor slabs shall be composed of class "A" concrete of the given proportions and the contract, if for unit prices, should give the price per yard of class "A" concrete wherever it is placed. The specifications should define the hand rail as consisting of vertical posts, top rail, intermediate panels or balusters, and bottom rail or base piece (if the latter is necessary to the construction of the hand rail), all made of concrete class "C" of given proportions or of class "C" and "D" and "E" of the required proportions and prices. The members included in the hand rails should also be specifically marked on the drawings, in which case no controversy could arise.

In the absence of these specifications, definitions, classifications, your letter itself affords the basis of a just determination in that "you should receive pay for the railing concrete as it is much more expensive than the floor slabs." That portion of the concrete above the top of the floor slab, the cost of which, completed, is materially greater than that in the floor slab should then be



all classified as "hand rail concrete," and paid for at that governing unit price.

Judging from the cross-section, the only question is whether the base piece engaging a longitudinal rib on the upper surface of the floor slab and itself recessed to receive the lower edge of the balusters or intermediate panels, be classified as class "A" concrete or as hand rail concrete.

If its mix is of the same proportion as that in the floor slabs, if the form work and placing are not much more costly than ordinary wooden form work in other parts of the structure that are classified as "A" concrete, it should be so classified, especially as it is closely structurally related to the slabs by reason of the bonding together with the long bent ends of reinforcement bars projecting from the floor slabs.

If, on the contrary, the concrete in this member is of a different mix from that in class "A," if it is more expensive to make and to place, or if it is finished in the same manner as that of the upper part of the hand rail and different from that of the floor slabs, it should be classed as hand rail concrete.

The assumptions made by you in preparing your estimate for the bid, or your own practice and that of the engineer on previous work of a similar nature, or the usual practice in your locality for such work, if any has been done before, should all be considered, and if these are contradictory, a just settlement should be secured by compromise based on the actual cost of constructing this part of the work.

Since the above was prepared, the following letters on the subject have been received and sent:

Dear Sir:

In reply to your letter of February 8, beg to state as follows:

I enclose herewith original blueprint of hand rail, also revised section. In estimating the labor for the forms on the hand rail, as shown in the original plans, in my judgment the plane of separation would be the point of gravel fill, leaving about 8 inches for a base on the hand rail. It would be very easy to set the forms for the same, assuming that point to be the plane of separation between class A and hand rail concrete.

The revised sheet distinctly shows the plane of separation to be the top of the floor slab line, which makes a very expensive form to make and set. My point is that owing to the change in the plans the plane of separation should be as shown on the revised sheet and all concrete above should be classified as rail concrete at the rail concrete price.

The engineer wants to make the plane of separation 6 inches above the gravel fill, leaving an 8-inch base, and classify between floor slab and base class A concrete. In the original estimate the approximate quantity of hand rail concrete was 43 yards and as everything was approximate quantities, this matter never came up until we began to place the hand rail concrete.

I trust I have made myself reasonably clear, but if not, will you advise me and I will answer whatever questions you make. There are no local decisions of which we know, as this is the second largest bridge in the state, and the matter has apparently not been litigated here.

I appreciate your courtesy in this connection, and will be very interested to hear from you again.

Very truly yours,

GENERAL CONTRACTOR.

In view of the additional facts disclosed in your favor of February 23, responsive to our reply of February 8, it appears that if the lower part of the hand rail was actually constructed at the same

time and with the same mix of concrete as the floor slab, and if a single form was used both for the floor slab and the lower part of the hand rail, the engineer's ruling is correct and only that portion of the base piece that is more than 6 inches above the top of the gravel fill is entitled to be classified as "hand rail concrete."

This classification corresponds substantially with the classification that you anticipated on the original design and apparently the difficulties of construction are not much increased above those of the original design, since the only material changes are making the base piece 6 inches higher and adding another reinforcement bar, which only involve larger dimensions and one more shoulder in the cross section and should make but little difference in the method or cost, although that little difference is to increase the cost. Such an increase is, however, well within the ordinary requirements of this class of construction.

If, on the other hand, the hand rail as shown in the revised cross section was actually made with the construction joint between it and the floor slab and was made after the floor slab was completed, using an entirely different and additional form that cost much more than the floor slab forms and the change was necessitated by the revision of the original plan on which you bid, the whole of the base piece down to the construction joint between it and the floor slab is entitled to be classified as hand rail concrete.

If in the revised plan the engineer had omitted the construction joint between the floor slab and the base piece and had also omitted the lower shoulder 6 inches high on the inner face of the base piece, just above the inclined surface, the cost of construction would have been little more than the original design and his allowance of only 6 inches in height for the hand rail base piece would be reasonable.

From the fact that he introduced another offset in the concrete and clearly designated a construction joint between the base piece and the floor slab it is fair to assume that he considered the revised higher base piece more difficult to construct than the original one and provided for its separate construction as an independent unit, which, forming part of the hand rail, is thus provided with an obvious limitation and should all be classified as hand rail down to the construction joint with the floor slab. The deliberate change in the drawing therefore strengthens your claim for classification which should be allowed.

Water Works Wireless

The water commission of Denver has installed wireless stations by which it communicates from Denver with the superintendent of the Cheesman dam 60 miles away and the head waters of the South Platt river. One of the employees of the water board in its engineering office who has made a study of wireless telegraphy installed the station at the dam. During 1920 the messages were sent and received in Denver at the Y. M. C. A. wireless station, but the commission expects to establish a station in its own offices this year.

Recent Legal Decisions

SUB-CONTRACTOR'S EXCAVATION CONTRACT CONSTRUED

A sub-contract for canal excavation for a government project not only referred to the plans and specifications in the original contract, but required the work to be done pursuant to the direction of the government engineers. The contractor was not required by his contract to complete omitted embankments left for subsequent structures. The Circuit Court of Appeals, Ninth Circuit, *United States v. Pearson*, 267 Fed. 814, holds that the sub-contractor was not required to return and excavate portions of the canal left by direction of the engineers to furnish dirt to fill the embankments over structures completed after the original excavation was made.

RESOLUTION OF INTENTION TO IMPROVE STREETS MUST BE PROPERLY PASSED

The Montana Supreme Court holds, *Hinzeman v. City of Deer Lodge*, 193 Pac. 395, that a resolution of intention, in due form and properly adopted, is the fundamental basis upon which all further proceedings to improve a street must stand. It is the essential thing which clothes the city authorities with jurisdiction to proceed with the proposed improvements. The very meaning of the word "jurisdiction" is power to hear and determine; and if no resolution of intention was passed, substantially as the statute provides, no power exists in the municipal authorities to let the contract or take any of the various steps necessary to create a valid improvement district. Therefore a resolution of intention to create a special improvement district was held not "passed" within the meaning of Montana Laws, 1915, c. 142, where not signed by the mayor until after publication, in view of Rev. Codes, par. 3205.

POSSIBLE NUISANCE BY SEWER HELD TOO REMOTE TO INVALIDATE TAX BILLS

In a suit against a city to declare certain district sewer tax bills void, the point was raised that the district sewer in question did not comply with the law in that it did not connect "with a public sewer or other district sewer or with the natural course of drainage" as required by the city charter. It was shown that, years before this district sewer was built, there had been constructed at public expense a sewer which had become known as the "lost sewer" or "dry tunnel." It was also shown that the mouth of this lost sewer did not empty into a natural drainage and that the flow from its mouth would spread out on the ground and become a nuisance to the surrounding neighborhood. It was also shown that the district sewer for which these tax bills were issued connected with this "lost sewer," and that all inflow into the former would be carried clear beyond the special district and to the mouth of the "lost sewer." The question was: Could the plaintiff complain when his district sewer did connect with this "lost sewer" (it being a tunnel

erected by the city as a public sewer) merely because the city had not taken the proper precaution to dispose of the waste at its mouth? The Springfield (Mo.) Court of Appeals, *Deming v. City of Springfield*, 224 S. W. 1004, holds that he could not, the fact that nuisance will be created at the outlet of the "lost sewer" being too remote.

INJURIES BY DEFECTIVE SPOUTS CAUSING ICY SIDEWALKS—INDEMNITY RECOVERABLE BY CITY FROM PROPERTY OWNER

The Springfield (Mo.) Court of Appeals holds, *City of Springfield v. Clement*, 225 S. W. 120, that where an abutting owner negligently permits the down spouts and cornice on his building to remain in a defective and leaky condition, causing a formation of rough and uneven ice and snow on a sidewalk, resulting in injury to a pedestrian, he is liable therefor. Where a judgment has been rendered against the city for the injury because of constructive negligence in permitting the sidewalk to become and remain in a dangerous condition, the city may recover the amount of the judgment from the owner in an action for indemnity, the owner not having been made a party to the action by the pedestrian.

IMPLIED DEDICATION AND ACCEPTANCE OF STREET NOT PROVEN

The West Virginia Court of Appeals holds, *Miller v. City of Bluefield*, 104 S. E. 547, that if an isolated and equivocal act done upon a piece of land by the public authorities, such as grading one end of it, fronting on a street, so as to make it accessible from the street, as if it were an alley, can be regarded as an attempt on the part of the public authorities to assume control thereof for public purposes, their failure to continue to perform acts upon it significant of public dominion and control, amounts to an abandonment of the attempt, and in such case there is neither sufficient public use and control nor acquiescence on the part of the owner to make out a case of implied dedication and acceptance.

CITY NOT LIABLE FOR OVERFLOW OF LAND NOT APPROXIMATELY CAUSED BY IT

In a suit to enjoin a city from causing water to be drained from a highway upon the plaintiff's land and for damages it appeared that the acts of the city complained of, in constructing a catchbasin and laying a 12-inch pipe therefrom onto adjacent land were not the proximate efficient cause of the surface water overflowing the plaintiff's land, but that the digging of a ditch on and from the adjacent land by the owner thereof, together with the smallness of a 6-inch pipe which was not laid by the city and for which it was not responsible, caused the plaintiff's land to be overflowed. The Massachusetts Supreme Court, *Blair v. City of Brockton*, 128 N. E. 941, held the city was not liable for the injuries therefrom.

NEWS OF THE SOCIETIES

March 11—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies Building, New York City.

March 14—CLEVELAND SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with Association of Iron and Steel Electrical Engineers.

March 14—AMERICAN RAILWAY SIGNAL ASSOCIATION. Congress Hotel, Chicago.

March 14—WATERBURY, CONN. SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

March 14—AMERICAN ASSOCIATION OF ENGINEERS. The third annual railroad conference. Chicago.

March 14-15—FEDERAL VALUATION OF RAILROADS. Congress Hotel, Chicago.

March 14-16—INDIANA SOCIETY OF SANITARY ENGINEERS. Muncie, Ind.

March 15-17—AMERICAN RAILWAY ENGINEERING ASSOCIATION. Chicago.

March 17—BRIDGEPORT, CONN. SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Chamber of Commerce.

March 18—DETROIT-ANN ARBOR SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with Detroit Engineering Society.

March 18—SCHENECTADY SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

March 20—VANCOUVER SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with B. C. Technical Association.

March 22—PHILADELPHIA, PA. SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineer's Club.

March 22—ATLANTA, GA. SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Carnegie Library, Atlanta.

March 22—BALTIMORE, MD. SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineers' Club.

March 23-24—AMERICAN WATER WORKS ASSOCIATION. Illinois Section. Annual meeting, Chicago, C. C. Habermeyer, Secretary, Urbana, Ill.

March 25—KANSAS CITY SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Northeast Power House of Kansas City Light & Power Co.

March 25—SAN FRANCISCO SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Substation of United R. R. of San Francisco.

March 25—COLORADO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Metropole Hotel, Denver.

March 25—METROPOLITAN SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineering Society Building, New York City.

March 30—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Directors' meeting, Atlanta, Ga. Secretary, James T. Mulcahey, Yonkers, N. Y.

April 1—VANCOUVER SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

April 11—HARTFORD SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. City Club, Hartford, Conn.

April 16—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with the Association of Iron and Steel Electrical Engineers. Pittsburgh, Pa.

April 18-23—UNITED STATES GOOD ROADS ASSOCIATION. Greensboro, N. C.

April 21-22—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. 5th annual convention. Greensboro, N. C. Secretary, J. A. Routree, Birmingham, Ala.

April 22—BIRMINGHAM SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with Atlanta, Birmingham and New Orleans sections, with members of Council present. Battle House, Mobile, Ala.

April 27—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual convention. Houston, Texas.

April 27-29—UNITED STATES CHAMBER OF COMMERCE. 9th annual meeting. Atlantic City, N. J.

April 27-29—BUILDING OFFICIALS' CONFERENCE. Seventh annual meeting. Cleveland, Ohio.

April 28-29—MID-CONTINENT SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting of Chemical Eng. Societies. City Auditorium or Convention Hall, Tulsa, Okla.

April 29—COLORADO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Metropole Hotel.

May 2-4—MISSISSIPPI VALLEY ASSOCIATION. 3d annual convention. New Orleans, La.

May 4-7—NATIONAL FOREIGN TRADE CONVENTION. 8th convention. Cleveland, Ohio.

May 9-11—AMERICAN ASSOCIATION OF ENGINEERS. 7th annual convention. Buffalo.

May 9-12—SOUTHWEST WATER WORKS ASSOCIATION. Shirvin Hotel Headquarters, Oklahoma City, Okla.

May 9-12—SOUTH-WEST WATER WORKS ASSOCIATION. Oklahoma City. Headquarters Skirvin Hotel.

May 17-19—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne, Ind.

May 20—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. 370th meeting. Engineering Societies Building, New York City.

June—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS. State of N. Y. 12th Annual Conference. Elmira, N. Y.

June 6-10—AMERICAN WATER WORKS ASSOCIATION. Annual convention at Cleveland, Ohio. Secretary, J. M. Diven, 153 West 71st St., New York.

June 7-9—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

June 21-24—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual and Pacific Coast Convention. Salt Lake City.

AMERICAN ASSOCIATION OF ENGINEERS

The third annual railroad conference will be held at the Congress Hotel, Chicago, March 14, and includes for the first time Canadian railroads. The main subject of this meeting is to develop cooperation between employers, employees and the public. The annual exhibition of the National Railway Appliances Association in the Coliseum will be open March 14 to 17, inclusive, from 8 a. m. to 6:30 p. m., except Tuesday, March 15, when the exhibition will close at 11 p. m. Practically every device used in the construction, maintenance and operation of railroads will be on exhibition. The program of the third annual railroad conference is tentatively outlined:

10 a. m. One Minute Reports from Railroad Section's official delegates.

"Effects of U. S. Railroad Labor Board's Decision on the Salaries of Railroad Professional Engineers," J. D. Trueblood, Asst. Engineer, C. & N. W. R. R. Discussion, led by Major

W. A. Hill, President, C. B. & Q., E. Section; J. R. Barclay, Secretary, P. & L. E. Section; Hardy Byran, Vice-President, No. Pac. Section.

"The Railroad Department of A. A. E. in 1920," E. L. Brandt, Assistant Secretary in charge of Railroad Department. Discussion, led by C. I. Long, Chief Draftsman, N. Y. C. Lines West; C. O. Axell, Chicago & Alton Section; W. S. P. Robins, Secretary, K. C. T. Section.

"Management," Professor Lewis Gustafson, Superintendent, David Rankin, Jr., School of Mechanical Trades; "Educational Plan Now in Effect," W. L. Lewis, President, G. N. Section. Discussion, led by V. L. Nelson, Secretary, T. & O. C. Section; P. D. Miller, Asst. Div. Engr. Pa. System; W. B. James, President, M. C. Section; Lem Adams, U. P. Section.

"Railroad Occupational Classification." Discussion, led by W. C. Bolin, Pilot Engineer, B. & O. R. R.; R. H. Kerr, President, K. C. T. Section; R. G. Aylsworth, Asst. Engr., C. B. & Q. Lines, West Section.

Report of National Railroad Council Sub-Committee on Revision of Salary Schedule, and discussion.

8 p. m. "A. A. E.—Its Beginning and Past," W. H. Finley, President, C. & N. W. Railway, Past President, A. A. E.

"A. A. E.—Its Present and Future," L. K. Sherman, President, A. A. E.

Address upon some big problems affecting the railroads, by a speaker of note.

BUILDING OFFICIALS' CONFERENCE

The seventh annual meeting of the Building Officials' Conference will be held in Cleveland, Ohio, April 27-29.

Meeting Wednesday, April 27, at the Hotel Statler at 10 a. m.; joint session with the Hollow Building Tile Association, and address by Charles C. Crockatt on "Hollow Building Tile and Its Relation to Building Laws and the Administration of Those Laws."

An address followed by discussion on the subject of "Standard Classification of Buildings as to Occupancy."

A visit to terra cotta plants in the vicinity of Cleveland, with members of the Hollow Building Tile Association, and a trip of inspection of a new type of eight-inch brick wall construction—at the invitation and suggestion of the Common Brick Manufacturers' Association.

April 28, business meeting. Afternoon session. Address by Dr. Robert H. Whitten, special city plan advisor for the City Plan Commission of Cleveland, on "Building Zones." Address by William Carver, of the Common Brick Manufacturers' Association, on "The Thickness of Brick Walls for Small Residence Buildings." A discussion on "Methods of Inspection." A discussion on "Signs and Other Projections in Public ways." Discussion on other topics of interest. April 29, trip to Massillon, O., to visit the plant of the National Pressed Steel Co. Buildings in construction of which metal lumber is being used will be visited. There will be a discussion on the use of metal lumber as a building material.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

AUSTIN-WESTERN ROAD MACHINERY

Catalog No. 20 of the Austin-Western Road Machinery Company is a sort of summary of twenty-six special catalogs of Western machines including reversible road machines, road planers, planer attachment, road drags, wheelers and scrapers, grading and

rooting plows, elevating graders and dump wagons, rock crushers and crushing plants, portable gravel screening plants, scarifiers, dump cars, reversible road machines, motor road rollers, tandem rollers, road scarifiers, roller scarifiers, grader scarifiers, motor sweepers, street sweepers, sprinkler sweepers, water sprinklers, pressure road oilers, gyratory rock crushers and

The Western scarifier is very strong and is successfully used in mountainous country and in hard boulder soil. The Austin Road Ripper is a massive scarifier attached for use on the mammoth senior or junior graders and when hauled by a tractor can tear up road surface at the rate of from $\frac{1}{2}$ mile to 2 miles per day.

with a pneumatic scarifier attachment. The Austin tandem motor roller is built in 5, 6, 7 and 8-ton sizes.

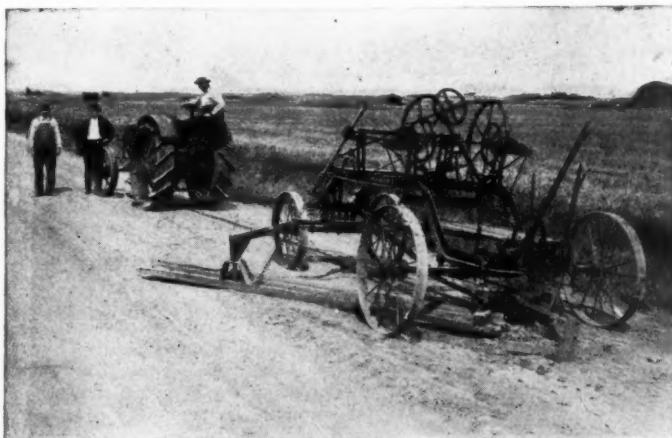
The Austin motor sweeper is made with a dipper cleaning attachment. The Austin street sweeper is recommended for cleaning streets and roads before they are oiled. The Austin combination sprinkler-sweeper is suitable when

the work to be done does not justify the purchase of an expensive equipment. The Austin street sprinklers and pressure road oilers are each operated by one man.

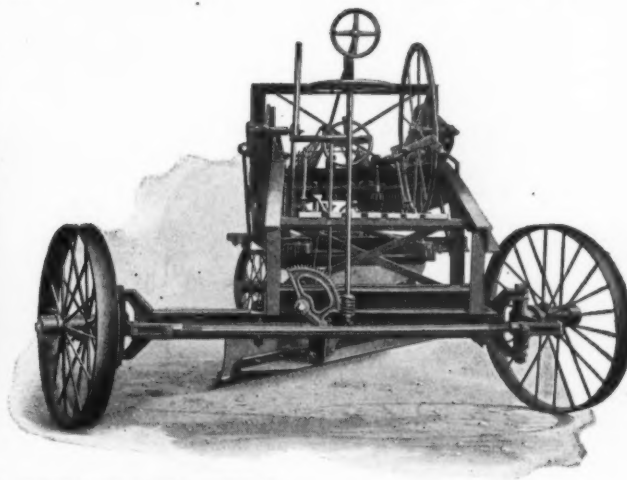
The Western elevating grader is built in three sizes with a capacity of 1,000 cubic yards per day and upward under favorable conditions. Many varieties of dump wagons, scrapers and plows are also listed. Brief descriptions are



ROAD SCARIFIERS



ROAD SCRAPING, DRAGING AND FINISHING MACHINES



crushing plants, elevating graders and dump and spreader wagons.

The number and variety of these machines is so great that one is to be found for any specified step of road and street building and maintenance. The list has grown from the first wheel scraper made by the Western Wheel Scraper Company more than fifty years ago to a line of Austin road rollers, both motor and steam made, in macadam and tandem types. The Western line of reversible graders embraces machines varying from 1,000 pounds to 9,000 pounds in weight, the smallest being easily operated by one man and two horses, while the largest is guaranteed to stand the strain of the most powerful traction engine. The advantages include an even cut, a floating, reversible scraper blade and ease of operation.

The Western road planer and finisher will resurface an entire roadway from ditch to ditch in one trip, leaving a uniformly plowed grade with a smoothly rolled, compact and perfectly finished center. Western road drags weigh 315 pounds, have blades 8 feet long and are heavily braced.

The Western-Aurora crushers and folding elevators have capacities of 9 to 25 tons of 2-inch rock per hour and require from 8 to 20 h. p. Portable bins and revolving screens are provided to go with them. Portable gravel and screening plants are also designed to be driven from the crusher. Stationary and revolving gyratory crushers have a capacity of 500 to 600 tons of rock per hour to a diameter of $2\frac{1}{4}$ to 5 inches.

The Austin single cylinder kerosene motor rollers are built in sizes of 7, 8, 10, 12 and 15 tons and can be fitted

given of them and they are illustrated by general views intended to be supplementary to complete details and specifications given in numerous special catalogs.

PAVING GUARDS

Paving guards for street railways and roadways are manufactured by the H. U. Boreau & Company and are designed to protect the adjacent roadway from damage by rail movement and displacement and from the action of water, impact, disintegration and displacement of the pavement and its foundation.

Their use is an economy in maintenance and permits the removal or adjustment of the track rails without delay or injury to the paved surface which forms a separate unit of roadway distinct from the tracks.